

### **REMARKS**

By this Amendment, Applicants propose to amend claims 1, 11, 15, 17, 19, and 21 to more appropriately define the invention. Applicants also propose to amend the Specification to correct typographical errors. Applicants submit that this proposed Amendment does not raise new issues requiring further search of the art. Therefore, Applicants respectfully request the entry of the Amendment. Upon the entry of the Amendment, claims 1, 3, 4, and 11-21 will remain pending.

In the Final Office Action, the Examiner objected to claims 15, 17, 19, and 21 for typographical errors; and rejected claims 1-4, 11-13, and 14-21 under 35 U.S.C. § 103(a) as unpatentable over Ye et al. (U.S. Patent No. 6,080,529) in view of Lau et al. (U.S. Patent No. 5,173,542).

Applicants submit that the proposed amendments to claims 15, 17, 19, and 21 will overcome the objection to these claims. Applicants respectfully traverse the rejection of claims 1-4, 11-13, and 14-21 under 35 U.S.C. § 103(a) because a *prima facie* case of obviousness has not been established by the Examiner.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103(a), each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element recited in the claims. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of the three

requirements must "be found in the prior art, and not be based on applicant's disclosure." See M.P.E.P. §2143, 8th ed., February 2003.

Claim 1 recites a method for forming fine gate electrodes of a semiconductor device that includes, *inter alia*, "forming a gate insulation layer over a semiconductor wafer; forming a conductive layer over the gate insulation layer; forming a low-dielectric layer over the conductive layer; forming a photoresist pattern . . . shrinking the low-dielectric pattern, so that the shrunken low-dielectric pattern has a linewidth smaller than that of the photoresist pattern . . . ; and forming fine gate electrodes by patterning the conductive layer and the gate insulation layer using the shrunken low-dielectric pattern as a mask."

In the Office Action, the Examiner considered Ye et al.'s copper layer 216 (col. 8, lines 30-31, Fig. 2A) as corresponding to Applicants' claimed "conductive layer," and considered Ye et al.'s tantalum nitride layer 218 (col. 8, lines 32-34, Fig. 2A) as corresponding to Applicants' claimed "low-dielectric layer."

The Examiner correctly recognized that Ye et al. "does not specifically mention shrinking the low dielectric pattern." Office Action, page 4. However, the Examiner alleged that Lau et al. "describes the standard procedure of the shrinking the low-dielectric pattern by curing the low-dielectric pattern ( Lau in col.14 line 37 and claim 11 . . . ) to cross link the polymers. The Examiner further alleged that "[t]herefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Lau's curing . . . step in Ye's method steps to cross-link the polymer of the low dielectric layer." Office Action, page 4.

Applicants disagree with the Examiner for the following reasons.

First, contrary to the Examiner's allegation, Lau et al. does not "describe[] the standard procedure of the shrinking the low-dielectric **pattern** by curing the low-dielectric **pattern**." Lau et al. only teaches how to form a thin film of crosslinked polymer. (Emphasis added.)

Particularly, Lau et al. teaches a crosslinking method by "[dissolving] [t]he polymer . . . in a solvent such as DMAc or NMP, with stirring and heating. The bistriazene compound in the desired amount is added to the still-warm polymer solution. . . . A thin film of crosslinked polymer can be obtained by spin-casting the formulation onto a 4X4 in (currently amended. 10X10 cm) glass plate. The coated plate is first 'soft baked' for 30 min each at 100° C. and 200° C. to drive off the solvent. The film is then cured at 400° C. for 30 min." Lau et al., col. 14, lines 24-37.

Clearly, the "curing" step alluded to by the Examiner is only part of a process for forming a film of crosslinked polymer, where the process uses a spin coating method to coat a solution onto a glass plate. Assuming, *arguendo*, that Lau et al.'s thin film of polymer corresponds to Applicants' claimed "low-dielectric layer," which Applicants do not concede, Lau et al.'s "curing" step would clearly need to be performed to "[form] [the] low-dielectric layer," rather than to "[shrink] the low-dielectric pattern." Lau et al. does not teach or suggest "patterning the low-dielectric layer" anywhere in its disclosure, and certainly does not teach or suggest at least "shrinking the low-dielectric **pattern**," as recited in claim 1. (Emphasis added.)

In other words, Lau et al. fails to cure the above-mentioned deficiency of Ye et al. At least on this basis, claim 1 is patentable over Ye et al. in view of Lau et al.

Second, there is no teaching in either Ye et al. or Lau et al. that would motivate one skilled in the art to combine these two references to result in Applicants' claimed invention. The Federal Circuit has repeatedly stated that "there is no basis for concluding that an invention would have been obvious solely because it is a combination of elements that were known in the art at the time of the invention. Instead, the relevant inquiry is whether there is a reason, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the references, and that would also suggest a reasonable likelihood of success." *Smiths Industries, Medical Sys., Inc. v. Vital Signs, Inc.*, 183 F.3d 1347, 1356, 51 USPQ2d 1415, 1420 (Fed. Cir. 1999). Ye et al. and Lau et al. lack such a reason, suggestion, or motivation.

Particularly, Applicants note that layer 218 of Ye et al., alleged by the Examiner as corresponding to Applicants' claimed "low-dielectric layer," is formed of "tantalum nitride" and "serve[s] as a barrier layer." Ye et al., col. 8, lines 32-34. In contrast, Lau et al. shows a polymer film. Ye et al. does not teach or suggest replacing the tantalum nitride layer 218 with a polymer film. Neither does Lau et al. teach or suggest curing a layer of "tantalum nitride." (Applicants do not, of course, concede that "curing" is equivalent to "shrinking," as discussed above.) Therefore, the Examiner has shown no motivation in the prior art for combining these two references in a way that results in the claimed combination. Indeed, the organic planarizing layer of Ye et al. cited by the Examiner would not have led one of ordinary skill in the art to the disclosure of Lau et al.

At least because Ye et al. and Lau et al. lack "a reason, suggestion, or motivation" for the combination thereof, Applicants respectfully traverse the Examiner's position.

Third, even assuming, *arguendo*, that Ye et al. and Lau et al. may be combined, which Applicants do not concede, the combination would only result in a failure of either Ye et al.'s or Lau et al.'s invention. For example, if Lau et al.'s polymer film replaces Ye et al.'s tantalum nitride layer 218, such polymer layer may not act as "a barrier layer." Ye et al., col. 8, lines 32-34. More particularly, Ye et al. requires that the barrier layer be "about 500 Å thick" (col. 8, lines 32-34). However, a polymer film formed in Lau et al. is typically "5-50[μm] thick." Applicants advise that such a thick polymer film clearly would not satisfy the requirements of Ye et al.

In view of the above, Ye et al. and Lau et al., taken individually or in combination, fail to teach or suggest each and every element of claim 1. One skilled in the art would not have been motivated to combine the references in practicing Applicants' invention as recited in claim 1. Nor would there have been any reasonable expectation of success in doing so. Therefore, claim 1 is allowable over Ye et al. and Lau et al.

Claims 3-4 and 18-21 depend from claim 1 and are therefore also allowable at least because of their dependency from an allowable base claim.

Additionally, claim 11 recites, *inter alia*, "forming a low-dielectric layer over [a] conductive layer; . . . patterning the low-dielectric layer using [a] photoresist pattern as a mask; . . . shrinking the low-dielectric pattern." At least for the same reasons set forth above, claim 11 is allowable over Ye et al. and Lau et al.

Claims 12-17, which depend from claim 11, are also allowable at least because of their dependency from an allowable base claim.

Applicants respectfully request that this Amendment under 37 C.F.R. § 1.116 be entered by the Examiner, placing claims 1, 3-4, and 11-21 in condition for allowance.

Applicants submit that the proposed amendments of claims 1, 11, 15, 17, 19, and 21 do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner, because all of the elements and their relationships claimed were either earlier claimed or inherent in the claims as examined. Therefore, this Amendment should allow for immediate action by the Examiner. Applicants also submit that the entry of the amendment would place the application in better form for appeal, should the Examiner dispute the patentability of the pending claims.

Applicants respectfully request the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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